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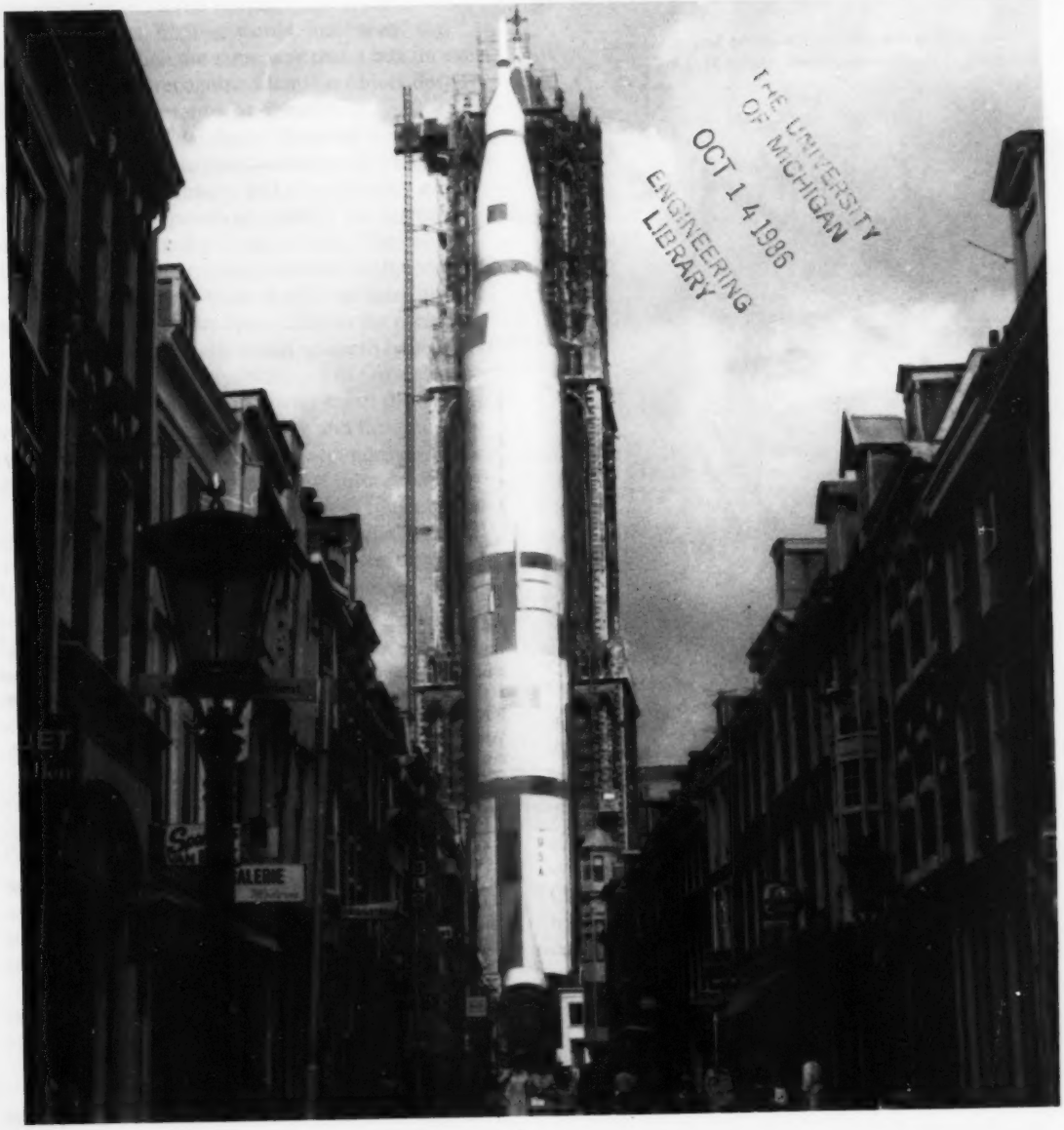

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About the Cover

A full scale model of the Saturn V rocket was placed in the center of the city of Utrecht (The Netherlands). This 110-meter-high two dimensional replica was erected against the 600-year-old Domtower. Coincidently, this tower has the same height as a Saturn V rocket. The idea for this remarkable feat came from Chriet Titulaer, a Dutch writer about space and science.

Utrecht housed the exhibition Space '86 with among many other unique items, full scale models of the Lunar Module, the Lunar Rover, an Apollo capsule (original), an Apollo parachute (original), an Intelsat VI, Giotto, Ulysses, Spacelab (original training-model), ECS, OTS, IRAS and ANS.

Space '86 also comprised a Space Art exhibition with the participation of the major Space artists from the USA and the USSR.

Space '86 concluded June 29, with the Saturn V model remaining at the Domtower until August 31, 1986.

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Teaching Machines To See

It is always quiet on the high frontier, 23,300 miles above the Earth, but in one particular spot in the valuable orbit where communications satellites do their work, a certain stillness signals a malfunction. A $60 million Comsat belonging to a U.S. consortium is dead in space. But help is on the way.

A robot vehicle has been sent up from the U.S. Space Station in low Earth orbit. As the robot moves in on the disabled satellite, it scans the spacecraft, comparing real time holographic imagery with its own database of stored images.

The robot has, in other words, just "seen" the satellite — in much the same way that a human eye can perceive and recognize a familiar object despite differences in orientation or distance.

From its internal database, the robot is able to compare the newly acquired holographic images of the satellite with memory, and after drawing a correlation, is able to positively identify the satellite, verify its position and plot its attitude. The robot then uses its synthetic vision, coupled with a variety of automatic controls, to dock with the satellite and maneuver it back to the Space Station for repairs.

As a result of synthetic vision research being done by Dr. Richard D. Juday, Manager of Optical Information Processing, other members of the Tracking Techniques Branch, Tracking and Communications Division, and other groups around the Center, this hypothetical scenario may be a future reality.

Juday is working on development of optical tracking techniques using Fourier optics, spatial light modulators, optical filters and optical correlators. Ultimately, these devices and techniques will allow a camera system, using the interactions of coherent light beams (and the properties of those beams), modulated by the camera images, to act as a virtual mimic of the human eye and brain. The system would be able to search for and identify various objects in space.

Before that is possible, however, a machine must first be able to cope with variables in sighting and recognition, such as distance and orientation. Jeff Swartz, Tracking Techniques Branch, is working on the design for a programmable retina that might help solve that problem. The retina would be used to adapt images so they could be easily identified regardless of their rotation or magnification.

"We are able to recognize an object even as distance and orientation change. We're looking at biological models for the programmable retina with respect to pattern recognition," Juday said. He is working with Dr. Marianne Rudisill, Crew Station Design Section, Man-Systems Division, on the flow of information through a biological system and how that can be adapted to synthetic vision.

Drs. Richard Juday and David Loshin examine a computer-controlled 2-axis positioner, part of the synthetic vision system they and others are working on. The positioner, designed and built by cooperative education students Tim Fisher and Brian Diauto, would aid the system in recognizing objects.

George Chaikin of Cooper Union in New York is also involved in applying the biological models to synthetic vision research. Juday, Rudisill and Chaikin are among a group of JSC employees, contractors and summer research faculty who are conducting a weekly colloquium on topics relating to synthetic vision and how it relates to NASA's long term requirements.

"I think we can come up with an optimum engineering system. The idea is to simulate, with elec-

tronics hardware, and with digital processing and optical coherent light processing, some of the aspects of biological vision systems," Juday said.

Funding for the research comes from the Technology Utilization Office and from the U.S. Army. Both organizations are interested in possible technology spinoff applications.

During the summer, Dr. David Loshin, an optometrist from the University of Houston, is working with Juday to see if some of NASA's research can assist the elderly with various vision problems. "NASA is allied with other groups, such as the National Institute for Aging and the National Institutes for Health to see what kind of technology can be used to help the general populace," Juday said.

One such application is age-related maculopathy, a vision deficiency resulting in a blind spot in the central part of a person's vision. Since there is a peripheral field of vision around the blind spot, researchers believe a programmable retina could help reproduce a complete picture in the surrounding area of vision.

As now envisioned, the equipment would consist of a small TV camera and a small display in front of the eye. Juday said the display would resemble a picture printed on a rubber sheet with a hole in the middle, then stretched out so that all of the image could be viewed in the peripheral area. "With the stretched out image, it would not look normal, but a person may be able to use it without being unduly disturbed by it. And it would give them more visual acuity. The images would look funny, but a person's visual processes are vary adaptive in being able to accommodate to strange circumstances," Juday said.

Military applications for optical tracking have already been tested, Juday said. "A number of people are working on that with varied success. There was a robot at Carnegie-Mellon University that found a couple of parallel lines to drive between — the only problem was that the lines were the left and right sides of a tree. Humans are certainly more adaptable than machines, but we would like to put artificial intelligence to work."

Juday has worked at JSC since his graduation from Rice University in 1966. While working here he has earned a masters degree from the University of Houston and in May was awarded a Ph.D. from Texas A&M University.

Juday worked in the Earth observations and remote sensing disciplines before going to work in the Tracking and Communications Division, and said his earlier work in image registration has carried over naturally into synthetic vision research.

Laboratory equipment for the research varies from the highly sophisticated to the highly innovative. Physicist Dr. Stan Monroe, for example, is using a miniature, off-the-shelf Radio Shack television, coupled with lasers and optical filters, to process images. At the same time, Texas Instruments is developing a spatial light modulator and will be delivering an optical correlator later this summer.

Another piece of equipment for the synthetic vision system was entirely designed and built by cooperative education students Tim Fisher and Brian Diauto. It is a two-axis positioner that would in some ways perform the same function as a human being's hand does in the process of pattern recognition. "When somebody hands you an object and says, 'Okay, what is it?' you naturally turn it over in your hands until you recognize it," Juday said. The positioner would rotate an image of a certain object until it matched up with a cataloged image in the computer memory.

The variety of individuals and organizations working on synthetic vision research is far reaching, and the researchers say they believe the development of new technology and equipment is advancing rapidly. With the addition of such equipment as optical correlators and spatial light modulators, they are looking forward to even more research capability in the future.

Remotely-Controlled Camera Records Bald Eagle Family Life

Whether gliding gracefully on broad-stretched wings or making power dives on unsuspecting prey, there are few sights in nature more dramatic than the American bald eagle at home in the wild. These are spectacles which few Americans are privileged to watch.

Only naturalists, wildlife managers and a few enterprising photographers have been able to witness eagle family life on the nest, a situation altered by photographs taken by a remotely-operated camera overlooking a Kennedy Space Center eagle nest.

The number of active southern bald eagle nests on the sprawling NASA Spaceport, originally acquired in the early 1960s for the Project Apollo voyages to the Moon, ranges from five to seven. The most visible nest is located in a tall pine tree to the west of the Kennedy Parkway between the Industrial Area and Launch Complex 39.

The adult birds have apparently adapted to the fire and thunder of rocket launches as well as the heavy automobile traffic on the center's major north-south highway. Nor do they seem to be disturbed by a large camera box placed on a pine tree branch over looking their nest from a distance of less than five feet.

The remote camera installation has been used to some extent since the early 1980s, but the photographic results from the breeding season just ended has produced the most spectacular coverage yet.

The 217 color photographs cover the period from Oct. 21, 1985 through March 18 of this year. They yield fascinating insights into the eagles' nesting behavior and the growth of a young eaglet from a down-covered chick to a robust fledgling able to make it on its own.

"This was our best season," commented Klaus Wilckens, the TGS Technology Inc. photographer who found time between 9 and 10:30 a.m. each working day to observe the nest and click the shutter if there was any visible action. TGS is the photographic contractor for the NASA Kennedy Space Center and the U.S. Air Force Eastern Space and Missile Center.

TGS technician Roland "Red" Williams, adapted a camera housing — normally used on Complex 39

launch structures — for service at the eagle nest located about 60 feet above the ground in the crotch of the tall pine tree.

The camera was a motor-driven F2 Nikon 35 millimeter with a 35 mm lens and a 250-exposure back. A six-volt battery in a weatherproof camera box disguised with camouflage paint was used to trip the shutter in single frames. Sound was deadened by foam insulation and moisture-absorbing crystals were placed in the box to control humidity. The box was sealed around the edges with silicone. The film was Vericolor Type S with a speed of ASA 100.

The control cable was housed in a protective conduit which extended down to the base of the tree and then underground and across a nearby drainage ditch. It then passed beneath Kennedy Parkway and emerged through a drainage grate in the median strip. It was from this vantage point that Wilckens conducted his daily vigil with powerful binoculars and tripped the shutter.

Those areas of the Spaceport not actively used for space operations are maintained for NASA by the U.S. Fish and Wildlife Service as the Merritt Island National Wildlife Refuge and the photographic effort was coordinated with wildlife officials on both the local and national level.

The camera box was erected in the tree on Aug. 12, 1985. It overlooked a nest about seven feet in diameter and approximately eight feet deep. It is generally flat on top with only a shallow depression in the center to shelter the egg and then the chick. The nests are used over and over again and there are records showing occupancy of this particular nest as early as 1964.

Wilckens' log records the first appearance of the adult birds at the nest on Oct. 21. Their first order of business was the repair of the nest and the erection of a raised barrier of twigs and small branches around the perimeter of the nest. A number of the photographs show the adult bird making nest repairs.

The single egg is first visible in a photograph taken on Nov. 15 and the down-covered hatchling made its debut in a shot taken on Jan. 2. The chick was only three to four inches long when hatched and its growth was rapid; by the time the final picture was taken on March 18, the eaglet had acquired the 12 to 14 pound weight and 7-foot wingspan of its parents.

According to Dorn Whitmore, outdoor recreation planner for the Wildlife Refuge, the Kennedy Parkway eaglet was one of five known to be hatched here during the just-ended nesting season. Four other nests were active during the year and two of them produced two eaglets each. The five fledglings for the year compare with seven in 1985 and 10 in 1984. The survival rate of hatchlings reaching adulthood runs about 50 percent.

Whitmore said the long-term prospects for the survival of the bald eagle — an endangered species — on the refuge is good. "We have a lot of old tall trees close to water and we're trying to manage the habitat." He indicated that the five to seven active

nests may be near the carrying capacity of the refuge.

Florida has been more fortunate than most states in retaining its eagles. Its estimated 350 breeding pairs represent the largest population in the United States with the exception of Alaska, which is estimated to have as many as 50,000 birds. Only 10 states are now believed to have more than 25 active nests.

But Florida's human population is growing and vigilance will be required if the nation's symbol is to remain a living presence in the state's skies.

"As Florida grows," predicted Whitmore, "additional waterfront areas will be developed. The long-term view in the state may be a decline."

The southern bald eagle is a sub-species found from Florida through North Carolina with a few wandering as far afield as Nebraska. Some are to be found in Florida on a year-round basis but peak populations are here in the winter when the food supply — consisting of fish and birds (cattle egrets, coot and ducks) is greatest.

Bald eagles are believed to live as long as 30 years in the wild and even longer in captivity. They mate for life; but if one dies, the survivor will accept a new mate.

Whatever the future may bring, the bald eagle is alive and well on the Kennedy Space Center and here — at last — its future looks bright.

NASA Features Aero-Space Plane, Research Pilots At EAA Convention

NASA returned to Oshkosh, Wisconsin, Aug. 1-8 for the 34th Annual EAA International Fly-In Convention and Sport Aviation Exhibition with a new exhibit entitled "21st Century Aviation." Other highlights of NASA's participation included special convention appearances by four flight research pilots and two Teacher-In-Space finalists.

Visitors to the NASA exhibit were treated to a glimpse of the future, including potential concepts for the National Aero-Space Plane Program, announced by President Reagan in his 1986 State of the Union address.

As envisioned, future hypersonic cruise vehicles would be capable of flying intercontinental ranges at high altitudes and very high speeds within the atmosphere, for example, reducing trip time from the U.S. West Coast to Tokyo to about 2 hours. The comparable subsonic flight takes more than 10 hours. A second major application would provide aero-space vehicles efficient and powerful enough to boost payloads and passengers to Earth orbit.

In a joint aero-space plane program with four Department of Defense agencies, NASA hopes to demonstrate technology for future hypersonic cruise and transatmospheric vehicles in a series of research flights beginning in the mid-1990's. Assuming aero-space plane technology is successfully demonstrated, the first operational vehicles would come sometime after the year 2000.

The three NASA aeronautics field centers supporting the Oshkosh exhibit this year were Langley Research Center, Hampton, Va.; Lewis Research Center, Cleveland; and Ames Research Center, Mountain View, Calif., which includes Dryden Flight Research Facility at Edwards Air Force Base.

Throughout the 6,000-square-foot exhibit, research tools and techniques needed for aircraft of the 21st Century were explored. Among the highlights were rapidly increasing computer capabilities:

- The Ames Center has a new supercomputer and simulation complex that soon will be capable of one billion computations per second. Complex measurements of aerodynamic flow fields that once took days or weeks will now take only minutes. The aerospace industry and universities also will use this resource.
- Advanced cockpits will make the most of computer technology. Aircraft displays may be touch-sensitive; aircraft controls may react to voice commands during peak work periods. The promise of a complete redesign of cockpits is generating increased interest in human factors research — how these and other projected technologies will affect pilot satisfaction and performance.

Other displays included a close look at rotorcraft research and potential applications. In addition, a variety of live and taped features were presented throughout the day in the Aerospace Theater. Outside the exhibit building was the popular AERO-VAN travelling exhibit.

NASA's aeronautical research was displayed in the agency's first exhibit of aeronautical art. Thirteen original works in a variety of media and styles were created by some of America's foremost artists through the NASA Art Program. Works included scenes from Chuck Yeager flying the X-1 to a model of the Space Shuttle in a wind tunnel for reentry tests. Artists whose works were represented in the collection included Ren Wicks, Stan H. Stokes, Nixon Galloway, William S. Phillips, Attila Hejja, Robert Schaar and Greg Mort.

For the second consecutive year, NASA's Goddard Space Flight Center, Greenbelt, Md., provided its SARSAT van, a mobile exhibit that presents an overview of the Search and Rescue Satellite system.

SARSAT is part of a multilateral cooperative program sponsored by the United States, Canada, France and the Soviet Union. The program's goal is to demonstrate the effectiveness of satellites in reducing the time needed to rescue air and maritime distress victims and significantly increase the possibility of saving lives. As of May 15, 1986, the number of lives saved had reached 576 — 244 marine, 311 air and 21 terrestrial — using up to five operational satellites over a 4-year period. The system has resulted in dramatically reduced rescue times and costs in most cases. The system is expected to become fully operational in 1990.

Another highlight of NASA's EAA Oshkosh 1986 involvement was the presence of four of the agency's research pilots, Warren G. Hall, Ames, Edward T. Schneider, DFRC, James M. Patton, Jr., LaRc, Earle O. Boyer, LeRc an iimportant element of flight research programs conducted at NASA centers around the country. The four appeared together in a special evening program and spoke individually at several forum talks throughout the week.

The agency's research pilots fly a mixture of missions in a variety of aircraft, ranging from atmospheric research over spewing volcanoes to new concepts of flight control for military fighters. Some of these pilots may be among the first to take America's aero-space plane to orbit. All of the agency's research pilots and their aircraft were featured as part of this year's NASA exhibit.

The Teacher-In-Space finalists were two of the ten chosen from among approximately 11,000 teachers for the agency's Teacher-In-Space Project. The two shared their experiences with young people and adults in several appearances during the EAA convention.

Finalist Robert Foerster is assigned to the Lewis Research Center as an educational consultant. Foerster is on leave from Cumberland Elementary School in West Lafayette, Ind., where he is a sixth grade teacher specializing in mathematics, science and computers. Finalist Niki Wenger is assigned to Langley Research Center. She is on leave from Vandevender Jr. High in Parkersburg, W. Va., where she teaches gifted and talented students.

More than two dozen other NASA speakers conducted technical forums throughout the convention, ranging from "Stall-Spin Research with Radio-Control Models" to "X-Wing: Developing Technology for a Supersonic Helicopter."

NASA Supercomputer System To Become Available Nationally

The world's most powerful supercomputer facility, the Numerical Aerodynamic Simulation (NAS) system, went on line to scientists and engineers throughout the country on July 21, 1986.

With the new system, more than 150 scientists from NASA centers, the Department of Defense, universities and industry began running research projects on the NAS supercomputer system located at NASA's Ames Research Center, Mountain View,

Calif. The NAS supercomputer complex will be linked with 27 remote locations across the country through a combination of high-speed terrestrial and satellite links.

For example, the NAS will give a scientist at Colorado State University direct access to the world's most powerful computer system via his personal computer. He can run complex programs using the full capabilities of the NAS system, located about 1,000 miles away. These programs can include the sophisticated color graphic displays of computational results, one of the main features of the NAS system.

The NAS system is chartered to progressively incorporate the world's most advanced supercomputer technology into the NAS facility and serve as a pathfinder in supercomputing for government, industry and universities. Work on the NAS system began at Ames in the mid-1970's. Last September, the CRAY-2 supercomputer was installed as the main computational engine. The NAS CRAY-2 is unique in having a 256-million word memory (largest yet available) and can perform 250 million computations a second.

Ames expects to select the next generation superfast computer currently referred to as the HSP-2 (High Speed Processor-2), within the next year. This machine is expected to perform a billion computations a second. This will bring the NAS system closer to its near-term goal of having computers with a billion word memory and computational power of 4 billion calculations a second. A longer term goal is to have a 10 billion computations-a-second capability within a decade.

Start-up of the NAS involved a selection process which resulted in the choosing of 97 research projects to use the NAS resources. The majority of these projects focus on aerodynamics and hypersonic flight research. NAS will be one of the prime national centers involved in development of the NASA/DOD National Aero-Space Plane. Other NAS projects will include astrophysics, computational chemistry, weather modeling and other large-scale computation problems.

Scientists and engineers located nationwide will interact with the NAS system's CRAY-2 and supporting processors, such as the Amdahl 5840s and VAX 11/780s, by using a NAS-developed operating system that is based on the UNIX system. This operating system will allow scientists to use their own graphic displays to interact with the CRAY-2.

The NAS system will be relocated to a new computational facility in late 1986 and will be fully operational in March 1987 when it will almost double the number of scientists and engineers using the system.

Trials Don't Erase NASA's Proud Record

Like a grounded eagle, America's space program is gathering its strength, healing its hurt and preparing for the time when it will again soar as it was created to do.

Throughout KSC are the signs of a renewed determination to return humankind to its new space frontier, as the Center's leaders and work forces start on the road to recovery.

A new momentum is emerging during the launch stand-down period as the team's members analyze, streamline, document and implement the new thrust.

The Shuttle Processing Team at KSC, including thousands of men and women from NASA, contractor and support organizations that has justifiably been called "the finest Space Team ever assembled" now faces an opportunity to prove itself even better, said Bob Sieck, KSC's director of Shuttle Management and Operations.

In a message from former Center Director Richard Smith to employees, he said, "While NASA has accepted the responsibility for the 51-L accident and the criticism of design and management failures which led to the tragedy . . . It would be an additional tragedy to allow this critical barrage to cripple our self-confidence and obscure our many shining achievements since the agency was created nearly 28 years ago.

"NASA and its contractors have not merely done things right over the past decades, we have done virtually every thing we have been asked to do superbly. Great dreams, which were mere science fiction in NASA's youth, are now historical fact.

"We have orbited inquisitive satellites to study our Earth and the space around it. Space-age communications, made possible by orbiting relay stations, have brought the remotest corners of the Earth to within telephone range and spaceborne weather sensors mean destructive storms can no longer threaten human lives without warning.

"Spacecraft of ever increasing sophistication and capability have been launched with human crews to orbit the Earth and leave twelve sets of footprints at six far-flung locations on the Moon as witness of our ability to explore the space frontier. Robot spacecraft have soared past the inner and outer planets to help us better understand the mysteries of our Solar System.

"We were — and are — on the cutting edge of technology. Many of the techniques, the materials and the technology we have developed to fulfill our goals in space have been transferred to the domestic

economy to permeate almost every facet of our daily lives.

"These technological miracles were not accomplished by faceless nonentities. They are the products of the daily efforts of this country's aerospace team . . . the things that all of us do when we come to work each day.

"It is a proud record. All of you may take pride in having played a role in writing some very prestigious pages in the history books . . . and we will be writing more!"

"During this recovery period," said Sieck, "our approach is similar to that of any team between seasons — work hard, train hard and further develop the tools which have been the foundation of the previous success."

And as the backlog of work that has developed over the years receives renewed attention, said Jim Rice, director of Center Support Operations, "Base Operation teams are now able to get to the on-line facilities and make the necessary modifications, improvements and perform routine maintenance.

During the stand-down, Sieck said, "We will focus on bringing the system closer to operational status, enhancing our work documentation systems, and improving our performance in many areas through additional training."

"Our payloads teams," said John Conway, director of Payload Management and Operations, "are working with renewed determination to demonstrate our ability both with Shuttle payloads and Delta vehicles. I am absolutely certain that we will emerge as a stronger and more capable organization in the future."

"We would like to erase that January day from our history," said Shuttle Launch Director Gene Thomas, but "there is still the pride that the Kennedy Space Center remains the world's foremost launch facility. There is still the determination that we will do our share in rebuilding our nation's confidence in NASA and its contractors. And there is still the same dedication of the world's greatest launch team that has been so successful in the past."

The performance of the KSC team always has been a source of pride to the team, the community and all involved in the space programs, observed Sieck. "After our next Shuttle launch, we will reflect back on this period and be thankful that we approached it with positive attitudes and aggressive efforts," he said.

From The Congressional Record

Senator George Mitchell (Maine), provided the following remarks concerning a possible joint mission to Mars.

In the years immediately ahead, the United States faces numerous crossroads. As a nation, we must confront issues — and hard choices — ranging from world trade to nuclear arms control.

The U.S. Space Program also faces major crossroads. In May, the report of the National Commission on Space, outlined possible challenges for us to pursue. We also have been reminded poignantly of the potential risks of those challenges, with the release of the report of the Presidential Commission on the Space Shuttle *Challenger* accident.

Major organizational changes now await NASA — along with a renewed commitment to safety, and design changes in the Shuttle Orbiter itself. But as the Rogers Commission pointed out in a "Concluding Thought" to its report, NASA and the Space Program are "a symbol of national pride and technological leadership.

The Commission applauded NASA's "spectacular achievements of the past" — and anticipated "impressive achievements to come."

One potential glimpse of achievements yet to come is provided by our colleague, Senator Matsunaga of Hawaii, in his recently published book "The Mars Project: Journeys Beyond The Cold War."

Senator Matsunaga's book is a statement of hope. It is a masterpiece of imagination and a blueprint for legislative determination. In one bold stroke, he addresses the need for the United States to retain our leadership in a global economy in the 1990's; the search for arms control and world peace; and the directions which our Space Program should follow.

"The Mars Project" challenges us to look beyond the arms race and the cold war to a joint, cooperative effort with the Soviet Union to launch a manned mission to Mars in the 21st century.

We already have taken first steps toward Mars. In 1976 — the year of the American Bicentennial — our Viking I and II space probes orbitted and landed on Mars. In 1988, the Soviet Union will launch an

unmanned scientific mission to the Mars moon, Phobos. In 1990, the United States will launch its Mars Observer probe.

There is no reason why the United States and the Soviet Union should not coordinate these next two scheduled missions to Mars, and use them as a springboard to the future. Together, we can proclaim 1992 as an International Space Year — the same year as the 500th anniversary of the discovery of America by Christopher Columbus; the 75th anniversary of the Russian Revolution; and the 35th anniversary of both the launching of sputnik and the International Geophysical Year.

The United States and the Soviet Union already have cooperated in the 1975 Apollo-Soyuz mission. The achievements of our respective space programs also are complementary. The Soviets have extensive experience with long-duration space flights. Americans have landed men on the Moon.

A joint American-Soviet mission to Mars would proclaim a bold frontier for the entire world. It would look beyond the strategic defense initiative to a higher purpose. Instead of "star wars," we would embark on a "star trek" together. Instead of the destructive competition of the arms race, it would represent a constructive, cooperative competition with the laws of physics.

My home State of Maine already has called on the United States Congress and the Soviet Union to rise to the challenge of peaceful space exploration. On February 21, 1986, the Maine State Legislature adopted a joint resolution calling on our governments "to do everything within their power to commit their nations to participation in a joint Soviet-American manned space flight to the planet Mars."

In the spirit of the late Samantha Smith, the young girl from Maine who traveled in 1983 to the Soviet Union on a mission for peace and understanding, the resolution of the Maine State Legislature was carried to Moscow in April 1986 by a delegation of 77 Maine high school students and educators. Leading the delegation was Mr. William Fortschen, a teacher at Mountview High School, who previously had been one of Maine's five finalists for NASA's "Teacher in Space" — an honor which finally went to our neighboring State of New Hampshire's Christa McAuliffe, who of course perished in the *Challenger* accident.

On April 22, 1986, the Maine students visited the Cosmonautics Museum in Moscow and presented the Maine State Legislature's resolution to former Apollo-Soyuz Cosmonaut Alexei Leonov. They also presented him with a copy of Senator Matsunaga's book.

Four Soviet speakers attempted to link the proposal of a joint American-Soviet mission to Mars to the need for the United States to abandon the strategic defense initiative — saying that our nations cannot afford to pursue both.

But 13-year-old Dallas Brennan of Maine challenged the Soviet representatives, asking why they could not simply accept the proposal. The Maine State Legislature's resolution was presented by children representing the children of Maine — and the Mars Mission must not be a pawn in the arms race, but rather, as an aspiration and bond between the children of our two societies.

The Soviets were stunned — and impressed — by young Dallas' forthrightness. They then broke into smiling laughter and applause when 9-year-old Edith Webster, another member of the group, presented the Maine State flag to Cosmonaut Leonov — and asked him to please take it with him when he goes to Mars.

Cosmonaut Leonov will not live to travel to Mars. But the son or daughter of a Soviet cosmonaut very well may — and I can think of no greater achievement for our nations than if they are accompanied by one of our own American sons or daughters.

Like Senator Matsunaga and the Maine State Legislature, I endorse the proposal for an American-Soviet mission to Mars. We also are not alone, and we are bipartisan in spirit. Senators Mathias of Maryland, Pell, of Rhode Island, Proxmire of Wisconsin, Simon of Illinois, Kassebaum of Kansas, Stafford of Vermont, and Gorton of Washington, who chairs the Senate Commerce Committee's Subcommittee on Space, also support the concept.

A joint mission to Mars will provide an ideal opportunity for asserting the U.S. technological leadership. As Senator Matsunaga declares in his book: "Space is responsive to American instincts . . . American genius works best when it has room. American ingenuity thrives in the expansive physical environment of a new frontier."

A joint mission to Mars also represents a more prudent investment than the Reagan administration's strategic defense initiative — which again, as Senator Matsunaga writes, "will have no constructive economic application and might not even work. Space weapons systems won't provide infrastructure or constitute stepping-stones for space exploration and settlement. They will just sit up there in space, a trillion-dollar building block to nowhere."

It will cost the United States at least $8 billion to construct a space station by 1993. A manned Mars mission will cost $40 billion by one estimate. Howev-

er, SDI would cost a hundred times that figure — and represent a tragic diversion of national resources.

On the other hand, a joint mission to Mars would spread the costs of space exploration. It would foster international cooperation and peace, not mutual distrust and the spectre of war.

Moreover, a joint American-Soviet mission to Mars will necessarily require the Soviet Union to join in open, democratic experiments. Again, as Senator Matsunaga so aptly points out: "Joint activity in space means open competition, which is inherently democratizing and favors free enterprise."

A joint mission to Mars would see levels of cooperation that elude us in other contexts. The 1975 Apollo-Soyuz Mission is a historical example. Its technical imperatives set precedents for openness, information exchange, coordination and verification — important issues which have otherwise defied resolution by our arms control negotiators.

We all share a hope for world peace. A joint mission to Mars could provide a vision of that peace.

Men and women must never cease to reach for the stars. Nations must never cease to reach out together in search of peace, in common spirit and purpose.

If not to ourselves, we owe this commitment to our children, and to future generations.

Presidential Management Improvement Awards

Vice President George Bush (right) recently presented 1985 Presidential Management Improvement Awards to a group of Langley Research Center employees. Jimmy H. Wilson (second from left), Robert R. Moore Jr., Joseph Getsug, Charles L. Crowder Jr., Kenneth N. Cole and James R. Dinkins were recognized for "their initiative and innovativeness in negotiating a contract with the local power company which led not only to a reduction in electrical power costs, but also to increased flexibility in the operation of major research facilities, thus saving the Government $5,700,000." The Vice President made the presentation on behalf of President Reagan, who annually authorizes such awards for federal and military personnel whose achievements during the fiscal year produced substantial benefits to the American people. The Langley group was one of eight groups and 11 individuals receiving awards for helping save American taxpayers more than $270 million. Accompanying the group to Washington, D.C., for the ceremony was Langley Director Richard H. Petersen (left).

Scientist Revolutionizes Making Of Sunglass Lenses

A NASA Ames research scientist has discovered a chemical process which has revolutionized the making of sunglass lenses. His new invention, utilized by a noted sunglass worker, holds the NASA record for the most units made and sold under a NASA license.

Theodore J. Wydeven, Jr., Ph.D., a physical chemist at Ames Research Center, discovered this process while working on another problem. Wydeven had a need to improve the thin semipermeable membranes of a spacecraft water purification process. One of the best ways to do this was to coat a proous filter with a thin plastic semipermeable film, using an electric discharge of an organic vapor.

Wydeven's process of depositing a thin plastic coating upon another dissimilar plastic sheet apppeared to have practical applications. As a result, this process was a key, according to the scientific and commercial communities, to resolving other problems. The sunglass manufacturers had a problem.

In the eyeglass makers' industry, ground and polished tempered glass has been the traditional and ideal lens. However, in recent years, the many virtues of polarized and other plastic lenses have been explored. Plastic lenses have excellent optics and better absorption of dangerous ultraviolet radiation. In addition, they are resistant to shattering, easy to shape, lightweight and more comfortable to wear than glass. But the major problem with plastic lenses is their susceptibility to scratching. After a few wipes and a few wearings of sunglasses with plastic lenses, a haze may appear which greatly reduces visibility.

A similar problem also exists with plastic space helmet visors. Through his research, Wydeven discovered an abrasion resistant coating and process for polycarbonate visors, and this is when one sunglass maker became more than interested in the scientist's invention.

Foster Grant Corporation, Leominster, Massachusetts, one of the world's largest manufacturers of non-prescription sunglasses, obtained a NASA license to use the Wydeven process in 1983. Under the license, the Foster Grant Corp. has used the process to coat over five million pairs of sunglasses in less than three years. These sunglasses are sold under the trade name of "Space Tech" and have generated approximately $75,000,000 in retail sales. The Space Tech sunglasses sell at most local retail outlets at a moderate price of about $15. The Space-Tech Lens not only holds the NASA record for the most units made and sold under a NASA license, but it will also stand up under normal wear five times longer than the most popular available plastic lenses. The coating process used is referred to as glow discharge or plasma polymerization. The compounds utilized in the procedure process are organosilanes which are plasma polymerized and then treated for a short time with an oxygen glow discharge to increase hardness or scratch resistance.

Did You Know?

J. Ray Dagenhart, an aerospace engineer in the Transonic Aerodynamics Division at NASA's Langley Research Center, was awarded the Floyd L. Thompson Fellowship for 1986-87 to study at Arizona State University.

The Thompson Fellowship Program was established in 1977 to encourage the development of research potential among the Langley staff. The fellowship allows researchers who have demonstrated continued growth in research to spend up to 12 months at an educational or research institution. It is named in memory of Dr. Floyd L. Thompson, Langley Director from 1960 to 1968.

At Arizona State, Dagenhart will conduct detailed experiments to measure the formation and growth of crossflow vortices on swept-wing surfaces. He will be working with Dr. William S. Saric, internationally known for his contributions to both experimental and theoretical boundary-layer stability research. "We will experimentally examine the transition from laminar to turbulent flow on swept wings. The three-dimensional flow over swept wings produces a layer of vortices which can interact with other instability models to cause early transition," explained Dagenhart.

"The formation and growth of these vortices will be measured and time-dependent velocity measurements will be made using multiple hot-wire probes. In addition, the flow field will be visualized by using various scientific techniques," he said. "This investigation should yield important insight for use in the design of future swept laminar-flow wings for low-drag application."

In his work at Langley, Dagenhart conducts ex-

perimental and theoretical research in support of the Laminar Flow Control experiment in the 8-Foot Transonic Pressure Tunnel. His assignments have included development and application of boundary layer stability analysis codes, design and conduct of the Gortler Vortex Experiment in the Low-Turbulence Pressure Tunnel, design of low-interference turbulence probes and calibration of suction flow measurement nozzles.

Dagenhart said that the proposed research activity directly supports two important Langley goals: viscous drag reduction and theoretical code validation. "During my stay at ASU, I expect to combine advanced measurement techniques and theoretical disturbance interaction predictions to produce a better understanding of the transition process on swept wings," he said.

Forty college engineering and science students were exposed to wide-ranging research at NASA Lewis Research Center in a summer program aimed at assuring a continuous stream of top talent for NASA as well as helping to alleviate a national shortage of such skills.

Participants in the four-year-old NASA-wide program were recommended by minority/female advancement programs at the universities and by an innovative program in which Lewis senior managers actively recruited students from their (managers') alma maters.

During the three-month period from early June to late August, the students worked on a research project so that their textbook knowledge may become practical experience. Lewis engineers and scientists worked alongside the students monitoring their progress.

"We attempted to match the research project to the student's individual talent, ambition and degree program objectives," explains Judy Montfort of the Lewis Equal Opportunity Programs Office who has headed the program since its inception. Hands-on training for the 40 engineering and science aides was augmented by specialized instructions and lectures on their assigned projects. The students were expected to make real research contributions as they proceeded. Colleges and universities represented in the program this year were Case Western Reserve University, Georgia Institute of Technology, Prairie View A&M University, Massachusetts Institute of Technology, Purdue University, Rensselaer Polytechnic Institute, University of Washington, Central State University, Illinois Institute of Technology, Spelman College, Hampton Institute, Cornell University, Southern University, University of Puerto Rico and Tennessee State University.

Two flight research and simulation computers used at NASA Ames-Dryden Flight Research Facility have been donated to Tuskegee University, Tuskegee, Alabama, by the space agency in recent ceremonies at Tuskegee. Representing NASA at the turnover ceremony were Dr. William F. Ballhaus, Jr., Ames Research Center director and Mr. Chuck Brown, Ames-Dryden Information and Simulation assistant branch chief.

The two ModComp Classic 7870 computers were accepted by Tuskegee University President, Dr. Benjamin Payton and Dr. Vasscar Harris, dean of the university's School of Aerospace Science.

The computers, which supported Ames-Dryden real time flight testing and "pilot and flight hardware in-the-loop simulation testing" from 1981 to 1985 will be used to support the university's aerospace program. NASA was able to donate the computers when they were replaced by high speed interactive Gould Sel computers.

The ModComp computers provide one megabyte of memory in each central processing unit. Each CPU has 32 analog to digital conversion channels, 96 digital to analog conversion channels and 96 input/output discrete channels.

"This donation will help strengthen and ensure a lasting and mutually beneficial relationship between Ames Research Center and Tuskegee University," said Brown.

A new model in honor of the late Dr. Judith A. Resnik, NASA Mission Specialist and a member of the Society of Women Engineers, was announced by the Society. The decision came during a meeting of the Board of Directors of the Society at the Kansas City Hyatt Regency Hotel, June 1, 1986. The medal, the Resnik Challenger Medal, will be awarded to a woman engineer for "visionary contributions to space exploration."

The medal will recognize obvious merit and significant contributions by an individual who has expanded the horizons of space exploration through engineering breakthroughs in aeronautical, astronautical, materials, electronics, ceramics, structural, bio-medical, or other space associated engineering. The award could be made to a woman engineer who has been practicing for ten or more years and meets the other qualifications. The entire engineering community including technical societies, engineering industries, academia, or individual engineers can nominate qualified candidates for the medal.

The NASA Headquarters Publications Branch has won many Blue Pencil Awards for Excellence for educational publications.

The branch has won First Place engraved plaques, and Second Place, Third Place, and Honorable Mention certificates in almost all of the fifteen categories in Government-wide competition over the years.

This year the Publication Branch has won First Place: Publication for general audience (four color) *NF-143 Magellan;* Honorable Mention: General brochure (one color) *Teacher In Space Lesson Plans;* Honorable Mention: Technical audience (two or three color) *Graduate Student Researchers Program 1986;* Third Place: Visual design *WAL-118 International Cometary Explorer.*

The National Association of Government Communicators was organized in 1961. It is a professional body of writers, editors, and information personnel whose responsibility is the effective presentation of media communications and Federal programs to the public.

The National Association of Government Communicators strives to:

1. Unite those engaged in creating and disseminating information concerning the Government.
2. Establish and promote high standards of individual professional and public service.
3. Develop an awareness that the professional communicator is an integral part of the decision and policy-making process.

Forty-six NASA Langley Inventors who received United States patents in 1985 and recipients of Langley's Technology Utilization Transfer awards were honored at a annual Inventors' Luncheon Tuesday, April 20. William D. Mace, Director for Electronics at the Langley Research Center, presented the awards to the following employees: (Pictured from left, first row): Robert J. Swaim, William J. Debnam, Jr., Linda B. Blackburn, Anne K. St. Clair, Diane M. Stoakley, Dr. Jag J. Singh, Robert F. Berry, David F. Johnson; (second row): Harold G. Bush, Harold D. Burks, John R. Ellingsworth, Ronald A. Outlaw, Dr. Leonard M. Weinstein, James F. Meyers, Richard W. Barnwell, Robert J. Fox; (back row): Dr. Terry L. St. Claire, Allan H. Taylor, Dr. Joseph S. Heyman, Timothy E. Hepner and Martin M. Mikulas.

The formation of a NASA Alumni League has been created to support the goals, objectives, programs and activities of the National Aeronautics and Space Administration as outlined in the National Space Act of 1958.

Membership is open to anyone who has ever been a NASA employee.

According to Robert C. Seamans, Chairman of the League's Board of Directors. "The Alumni League is committed to the principle that America's civil space program is fundamental to the evolution of the human spirit, to the healthy progress of civilization and to a strong United States. The League will have close ties with NASA and will strive to assist the agency in its endeavors, while maintaining independence in policy matters."

Alumni League President, Gerald D. Griffin said. "The League is committed to restoring public appreciation of the value, accomplishment, challenge, risk, and adventure that characterize space activity. We are prepared to provide advice, counsel, and comment on key space issues. We intend to work closely with the private sector, the media, the Congress, and the Executive Branch in focusing the expertise for our members in the Nation's interest."

The League will be governed by a Board of Directors.

Revenues to support League activities will come from annual membership dues, which are tax deductible. Membership categories are: individual, $30; supporting, $100; sustaining, $250; life, $500; or benefactor and life, $1000.

Any eligible person interested in becoming a member should write NASA Alumni League, 600 Maryland Avenue, S.W., West Wing Suite 203, Washington, D.C. 20024.

NASA, in conjunction with DOE and DOD, sponsor the Interagency Advanced Power Group (IAPG), whose main purpose is to promote the exchange of information and avoid duplication of R & D efforts among federal researchers in advanced power fields. One way members of the IAPG coordinate their information exchange is by attending semi-annual meetings of IAPG Working Groups/Panels. These include: Auxiliary Components, Chemical, Heat Engines, Magnetohydrodynamics (MHD), Nuclear Power Conditioning, Solar Photovoltaic, Solar Thermal, and Systems. Recently, a new IAPG Pulse Power Panel was initiated to focus on power systems capable of producing large electrical pulses for a wide range of applications. Members of the panel will meet on October 28, 1986 to exchange information on the status of federally-sponsored research in this area—research such as devices under consideration for SDI, propulsion systems, and research and test equipment.

The high level of interest in this technology is reflected in the enthusiastic response to the formation of this panel. Since April, 1986, when the panel was officially initiated, 48 members and observers have joined.

Would you like to learn more of what's going on in this research field?

Do you see the benefit in sharing your research accomplishments with others in-house as well as outside of your research community?

The IAPG set up the Power Information Center to distribute periodic publications, coordinate semi-annual meetings and maintain a data base of projects in chemical, electrical, mechanical, nuclear, solar, and systems R&D. Membership is *FREE* to employees of the IAPG member agencies.

For further information on participation in the Pulse Power Panel, attending the October 28 meeting, or the IAPG, contact Judi Decker, Program Coordinator, or Liz Feinberg, PIC Manager, at (202) 842-7600

NASA has formed two teams to review Space Station design and work package assignments and functions.

A Space Station Configuration Critical Evaluation Task Force, headed by W. Ray Hook, Manager, Space Station Office at NASA's Langley Research Center, Hampton, Va., will conduct a technical review of Space Station architecture and systems. The task force will conduct their activities at Langley. An Executive Technical Committee, headed by Andrew J. Stofan, will provide oversight and guidance to the task force and will assess the impact of any design modifications or changes on individual NASA center and contractor roles.

Stofan's actions are in response to NASA Administrator James C. Fletcher's July 31 directive to conduct a thorough review of all aspects of Space Station design and to hold off the implementation of work package realignment for a period of up to 90 days.

Approximately 35 people will serve on the task force full time, several hundred more will take part in the technical evaluation, including NASA personnel from the work package centers and from outside of the program, Phase B contractors, and representatives from user groups and the international partners.

Astronaut Frederick (Rick) Hauck was named Deputy Associate Administrator for External Relations effective August 11.

In this position, Hauck will share responsibility for policy level management, direction and coordination of the agency's relationships with public and private organizations both domestic and international. This includes the news media, other federal agencies, state and local governments, foreign governments, international agencies, industry and private individuals.

A Navy captain, Hauck was selected as an astronaut candidate by NASA in January 1978. He was commander of STS-51A and pilot for STS-7. He also was a member of the support crew for STS-1 and re-entry capsule communicator on the support crew for STS-2.

Born April 11, 1941, in Long Beach, Calif., Hauck received a bachelor of science degree in physics from Tufts University in 1962 and a master of science degree in nuclear engineering from the Massachusetts Institute of Technology in 1966.

A Navy ROTC student at Tufts, he served 20 months as communications officer and combat information center officer aboard the destroyer USS Warrington. After receiving his wings in 1968 from the Naval Air Station in Pensacola, Fla., he flew 114 combat and support missions in Southeast Asia while stationed aboard the carrier USS Coral Sea. In 1970, Hauck was selected for test pilot training at the U.S. Naval Test Pilot School, Patuxent River, Md.

Hauck has flown various aircraft including the A-6, A-7 and F-14. He has been awarded 9 Air Medals, the Navy Commendation Medal with Gold Star and Combat V and the NASA Space Flight Medal. He also was named Outstanding Test Pilot for 1972.

Captain Hauck is married and has two children.

William H. Dana was appointed Chief Pilot at NASA's Ames-Dryden Flight Research Facility. He has been with NASA since 1958 as an aerospace research pilot. Dana is shown with the X-15 rocket-powered research aircraft, which he flew 16 times, reaching a top speed of 3,897 miles per hour and a peak altitude of 310,000 feet (almost 59 miles high). He also flew wingless lifting bodies, forerunners of the Space Shuttle and has flown many other NASA research craft. Dana is a member of the Lancaster-based Society of Experimental Test Pilots.

Lt. Gen. Forrest S. McCartney, Commander of the Space Division, Air Force Systems Command, Los Angeles, was named Director of the Kennedy Space Center, Fla. On assignment from the Air Force, he is expected to report to NASA on approximately October 1.

Born March 23, 1931, in Ft. Payne, Ala., McCartney received a bachelor of science degree in electrical engineering from the Alabama Polytechnic Institute, Auburn, in 1952 and earned a master's degree in nuclear engineering from the Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio, in 1955. He also is a graduate of the Armed Forces Staff College, Norfolk, Va.

McCartney's Air Force assignments have included the Satellite Control Facility, Sunnyvale, Calif., as a satellite controller during early space operations; the Office of Space Activities, Headquarters Air Force Systems Command, Andrews Air Force Base, Md., as a project officer in the Titan III program and various Air Force communication satellite programs; the Directorate of Space at Headquarters U.S. Air Force, Washington, D.C., as the program element monitor for satellite communications programs and other selected space-related efforts; and the Air Force Eastern Test Range, Patrick Air Force Base, Fla., as director of range engineering.

In June 1974, McCartney was assigned to the Space and Missile Systems Organization at Los Angeles Air Force Station as the systems program director for Fleet Satellite Communications Systems. In August 1976, he was reassigned within the organization as deputy for space communications systems.

McCartney moved to Norton Air Force Base, Calif., in September 1979, as vice commander of the Ballistic Missile Office and was named commander of the Ballistic Missile Office and M-X program director in November 1980. He became vice commander of the Space Division in May 1982 and commander, Space Division and vice commander, Space Command in May 1983. Upon activation of the U.S. Space Command, he was redesignated commander of the Space Division in October 1985.

His military decorations and awards include the Distinguished Service Medal, Legion of Merit with one oak leaf cluster, Meritorious Service Medal and Air Force Commendation Medal with three oak leaf clusters. He also wears the master missile badge and the master space badge.

The following is an informal listing of organizations, officially reported to NASA, established following the 51-L accident.

Space Shuttle Children's Fund: American Security Bank, 1501 Pennsylvania Ave, Washington, DC 20005.

NASM Building at Dulles Airport, which will house the Enterprise. The building is to be called Challenger Hall.

Challenger Fund: P.O. Box 51-L, Colorado Springs, Sponsored by the U.S. Space Foundation, P.O. Box 1838, Colorado Springs, CO 80901.

Challenger Fund: % The Space Foundation, P.O. Box 58501, 711 Bay Area, Suite 300, Houston, TX 77058.

Space Camp/Challenger Memorial Fund: Scholarships for underprivileged children to the Space Camp in Huntsville.

USA Challenger Scholarship Foundation, L. I. Hanson, P.O. Box 681053, San Antonio, TX 78269.

Resnik Memorial Scholarship Fund: University of Maryland.

Resnik Scholarship Fund: Akron Public Schools, 704 North Broadway, Akron, OH 44308.

Resnik Scholarship Fund: Carnegie-Mellon University, 603 Warner Hall, Pittsburgh, PA 15213.

Judith Resnik Endowment: American Association of University Women, AAUW Endowment, 2401 Virginia Avenue, NW, Washington, DC 20037.

Challenger Benefit Fund: % Texas American Bank, Trust Division, P.O. Box 2529, Houston, TX 77252.

Reach for the Stars 89: Box 2180 Ventura, CA. 93001.

Teacher in Space Education Foundation: 1110 Vermont Ave., NW, Suite 710, Washington, D.C. 20005.

Onizuka Memorial Committee, P.O. Box 1927, Kailua-Kona, Hawaii 96745; 808/329-1634.

Challenger Center for Space Science Education, 1550 West Bay Area Blvd., Suite 102, Houston, TX 77258-8000.

Ron McNair Committee, P.O. Box 663, Lake City, S. C. 29560.

Ronald E. McNair Scholarship Fund: Established at North Carolina A&T State University, Greensboro, NC.

Ron McNair Scholarship Foundation: P.O. Box 54281, Atlanta, Ga. 30308.

Astronauts Memorial Foundation, Inc.: P.O. Box 628003, Orlando, FL 32862-8003.

Space Flight Memorial Foundation, JSC: P.O. Box 58009, Houston, TX 77258-8009.

The first anniversary of the International Cometary Explorer (ICE) intercept of a comet was spotlighted at Washington, D.C.'s National Air and Space Museum on Sept. 11 in a six-part symposium on deep space gymnastics.

Sponsored by NASA's Goddard Space Flight Center, Greenbelt, Md., the symposium featured six presentations by university, industry and government scientists and engineers explaining the physics and techniques for maneuvering spacecraft to gather valuable scientific data through planetary swingbys and interplanetary coasting.

Among the symposium participants was Robert W. Farquhar, an engineer from Goddard who described his role in the historic intercept of Comet Giacobini-Zinner by the ICE spacecraft on Sept. 11, 1985.

In this unprecedented encounter, Farquhar "threaded" the ICE spacecraft—travelling at a speed of 46,000 miles (74,000 km) an hour—through the tail of the comet while it was 44 million miles from Earth.

The data from that mission both added significantly to and confirmed many predicted features of a comet.

The encounter was the zenith of a 7-year odyssey through space for the ICE—launched in 1978 as the International Sun-Earth Explorer (ISEE))—which Farquhar maneuvered past the Moon five times in 1983, using lunar gravitational assists to "slingshot" the spacecraft toward its rendezvous.

Other speakers included Dr. William I. McLaughlin, manager, Mission Profile and Sequencing Section, Jet Propulsion Laboratory, Pasadena, CA.; Roger E. Diehl, Jet Propulsion Laboratory; Chauncey W. Uphoff, private consultant and Dr. Kathleen C. Howell, assistant professor, School of Aeronautics and Astronautics, Purdue University.

New Horizons Mentors

Langley Research Center employees who have served as mentors for the New Horizons Magnet Program at the New Horizons Technical Center were honored at a reception June 17. The mentorship experience began in December 1985 for students from the center, Langley's adopted school, to spend a portion of their academic instruction in a real-work situation with a NASA volunteer. At the reception the students and staff expressed their appreciation to the NASA mentors: (front row, from left) Shelley Canright, magnet program coordinator; Robert Daugherty; Victor Carreno; Jeff Cleveland; Salvatore Bavuso; Linda Haugh; David Dress; Robert Miserentino; Dick Hellbaum; (back row) Michael Hart; Katherine Smith; Jose Ortiz; Dr. Alan Pope; Dr. Robert Kilgore; Bill Kahlbaum; and Dennis Bushnell. Mentors unable to attend the reception were Richard Margason, Grace Liu, William Henderson, Wallace Sawyer, Dana Dunham, George Ficklen, Dr. Charles Byvik, Don Soloway, Dr. Pat Murphy, James Dezern, Dr. Wolf Elber, Sheila A.T. Long, John Wagner, Roane Hunt, Chris Glass, Stan Cole and Dr. Manuel Stein. The program will continue in September with new high school students and new NASA mentors.

Contractor News

NASA selected **Sverdrup Technology, Inc.,** Tullahoma, Tenn., for negotiations leading to the award of a cost-plus-award-fee contract for technical support services at NASA's National Space Technology Laboratories (NSTL), Bay St. Louis Miss.

Sverdrup's proposal reflected a proposed cost of approximately $45 million for a period of 3 years beginning in the fall of 1986. The contract will provide for a total period of performance of up to 8 years, consisting of the basic contract year, two 1-year priced options and five 1-year unpriced options. As proposed by Sverdrup, the total contract has a potential overall estimated cost of approximately $105 million. Each of the first 3 years also includes price options for additional effort.

Technical support services covered by the contract consist of test complex services for Space Shuttle main engines, engineering services, laboratory and field services, and data services for NASA and 18 other government agencies located at NSTL.

The contract will be managed by NSTL.

NASA selected **TRW, Inc.,** Redondo Beach, Calif., for negotiations leading to the award of a contract for the full-scale design, development, test, verification and delivery of the Orbital Maneuvering Vehicle (OMV) flight vehicle including its Airborne Support Equipment (ASE), Ground Support Equipment (GSE), Ground Control Station (GCS), spares, tooling and support equipment. Included in the effort are plans and operations associated with the Design, Development, Test and Evaluation (DDT&E) for one flight Grumman Aerospace Corp., Bethpage, N.Y., and SPAR Aerospace Ltd., Weston, Ontario, Canada, are team members.

The OMV is a reusable, remotely-operated propulsive vehicle that increases the range of the Space Transportation System. The primary uses of the OMV will be spacecraft delivery, retrieval, boost, deboost and close proximity visual observation beyond the operating range of the Space Shuttle. In addition, the basic vehicle will be configured in a way that will be readily adaptable to support Space Station activities.

TRW's proposal, including a priced option for one additional vehicle, reflected a proposed cost of approximately $205 million. The contract will be on a cost-plus-award-fee basis. Anticapted basic period of performance will cover approximately 5 years.

The OMV contract will be managed by NASA's Marshall Space Flight Center, Huntsville, Ala.

NASA's Marshall Space Flight Center, Huntsville, Ala., awarded a 7-month, $93,000 contract to **Martin Marietta Corp.,** New Orleans, to study the feasibility of converting a Space Shuttle external tank to an orbiting telescope.

According to Max Nein, advanced systems division at Marshall, the proposal to transform the external tank into a Gamma Ray Imaging Telescope (GRIT), to study gamma ray sources in the Universe, appears possible. Studies have determined that the spent tanks, 154-feet and 27.6 feet in diameter, could be carried into orbit rather than discarded just before the Shuttle achieves orbit. Components of the telescope would be carried in the Shuttle's cargo bay along with other payloads. Because the telescope would require periodic maintenance, it probably would orbit near the planned Space Station, 230 to 345 miles above Earth. The proposal was initiated by Dr. David Koch, Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.

"Once in space, residual propellents would be expelled from the tank and astronauts could assemble telescope components within the liquid hydrogen tank. They could enter the tank via an existing 36-inch aft manhole port or through tank modification. The tank then would be pressurized to provide the needed environment for the gamma ray detection technique," Nein said.

In operation, gamma rays would be converted by a lead plate into positions and electrons which travel the length of the telescope emitting light. The light would be imaged onto a detector by a large mirror spanning the diameter of the tank. Since gamma rays reflect the highest energy processes, gamma ray astronomy is essential to understanding the evolution of stars and the Universe and to the physical processes occurring in pulsars, quasars and black holes.

Nein said NASA plans to conduct a separate gamma ray survey using the orbiting Gamma Ray Observatory (GRO). The Gamma Ray Imaging Telescope would follow up the work of the GRO by enabling NASA to conduct even more detailed gamma ray studies.

"We hope the feasibility study now in progress will help us learn more about meeting the scientific and engineering challenges related to turning the external tank into a valuable resource for the space-based study of gamma ray astronomy," Nein concluded.

Martin Marietta manufacture the Shuttle external tank under contract to MSFC, at NASA's Michoud Assembly Facility, New Orleans, where the study is being performed.

Another Dividend from Air and Space

Research and development in aeronautics and space have provided numerous benefits for all Americans—and at a tiny percentage of the tax dollar. Here is an example:

Bone Analyzer

One of the dangers of long-duration space flight is disuse osteoporosis, a form of bone deterioration induced by astronaut inactivity under weightless conditions. However, the crew of the Skylab 4 interim space station demonstrated, on an 84-day mission in 1973, that adequate food and exercise can reduce bone loss. Contemplating future manned missions that might run two years or more, NASA sought a practical, inexpensive, noninvasive way of making quantitative measurements of bone stiffness and mass, a system sensitive enough to monitor and evaluate small changes. This would enable comprehensive studies of the effects of nutrition and exercise, toward developing food/exercise programs to prevent astronaut bone loss. Since bone deterioration affects a substantial portion of the U.S. population, it would also meet a need — in hospitals clinics and convalescence homes — as a tool for diagnosis of bone abnormalities caused by disease, aging and disuse, and a means of evaluating fracture healing.

Such a system is now in final development status after a decade of effort by the Biomedical Research Division of Ames Research Center, which funded and teamed with Dr. Charles R. Steele, Professor of Applied Mechanics at Stanford University's Department of Aeronautics and Astronautics. In 1977, the Ames/Stanford team developed a prototype microprocessor-controlled bone probe system; built by Oxbridge Associates, Sunnyvale, California, it was known as SOBSA (Steel-Oxbridge Bone Stiffness Analyzer). Tests with human subjects indicated that SOBSA could be used clinically but it had certain limitations with respect to accuracy, sensitivity and operator training requirements. Through its Technology Utilization Program, NASA funded construction of an advanced SOBSA-2 featuring improvements in those areas.

SOBSA-2 is a computer-controlled impedance probe system in which bone stiffness is determined quantitatively by measuring responses to an electromagnetic shaker. The subject's bone is constrained at each end (below), the shaker applies vibration and the probe measures the resulting impedance (electrical resistance), providing a basis for computer analysis and determination of bone stiffness. Such information can be used by physicians to detect the presence of bone disease, to measure the extent of deterioration, and to aid in prescribing therapy.

SOBSA-2 has been further refined and it is now undergoing clinical testing at Stanford University Orthopedic Clinic, performing measurements on patients before and after total hip, knee, shoulder and elbow replacements. The latest model has a more powerful controller, permitting extensive data collection and analysis in a short time. By the end of year, it is expected that the system will have demonstrated the desired accuracy and repeatability over a wide range of subjects.

* NASA does not endorse commercial products developed as a result of its Technology Utilization or Patent Licensing Programs, but it does encourage the widest possible use of its technology.